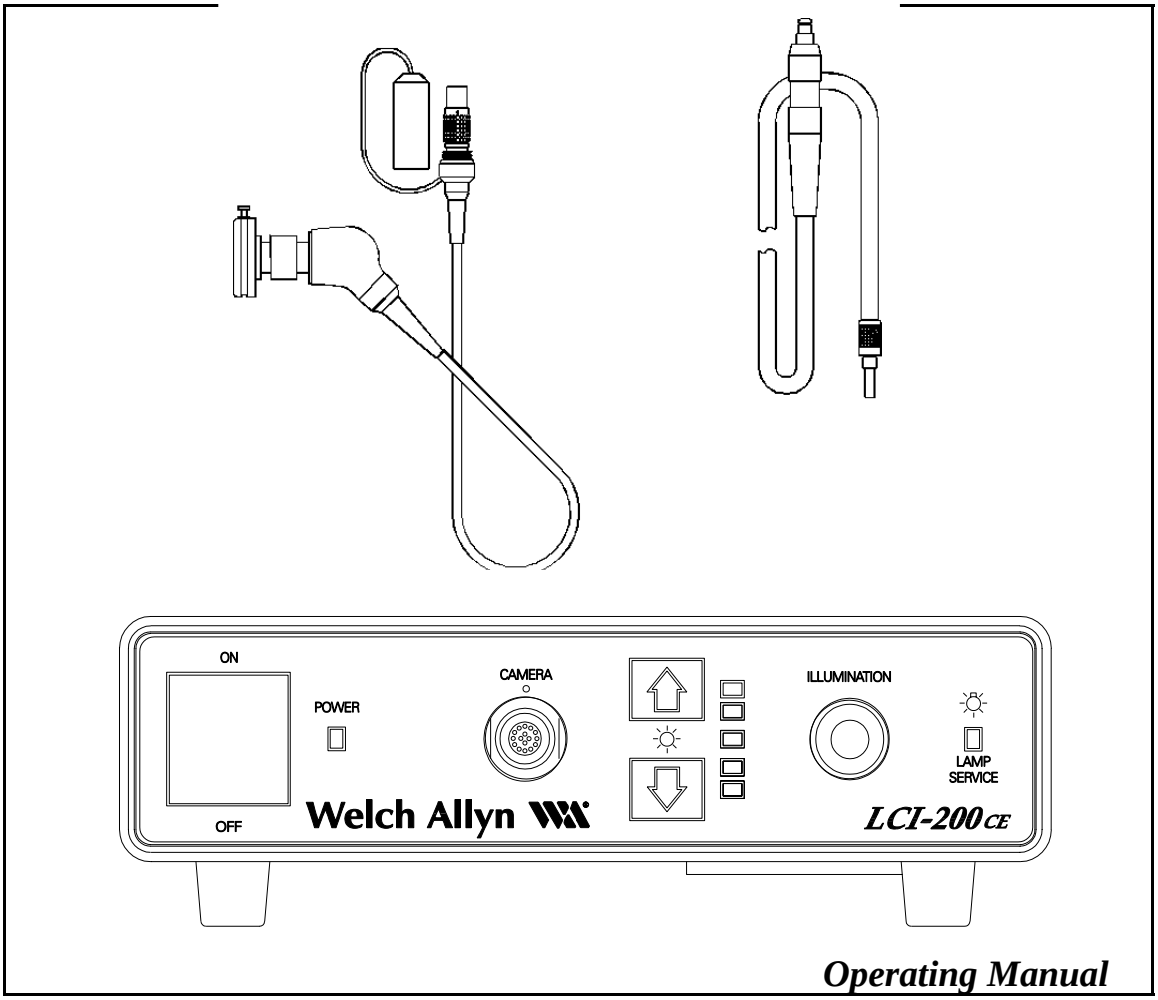
Exam/Procedure Light

Service Manual

LCI-200CE

Illumination and Imaging System



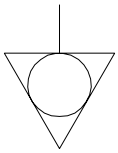
Operating Manual

Welch Allyn

808596
Rev. A

System Symbol Descriptions

Attention. Read Operating Manual for Warnings, Precautions, and Instructions for Use.

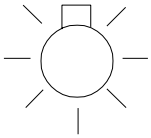


Potential Equalization Stud

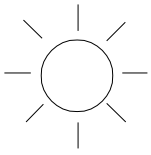
Dangerous Voltage: Refer Servicing to Qualified Personnel

Type B Equipment

Warning: Risk of Fire. Replace Fuses as Marked.



Lamp Service

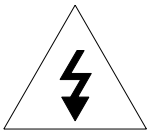


Picture Brightness

WARNINGS/CAUTIONS

CAUTION: IF THIS IMAGING AND ILLUMINATION SYSTEM IS USED DURING INVASIVE SURGERY, THE FAILURE OF A COMPONENT WITHIN THE SYSTEM, FOR EXAMPLE, LOSS OF VISUALIZATION, MAY INDIRECTLY CAUSE RISK TO THE PATIENT, THEREFORE, IT IS RECOMMENDED TO HAVE ALTERNATIVE MEANS AVAILABLE.

1. POSSIBLE EXPLOSION HAZARD. Do not use in the presence of flammable anesthetics.



2. THE TOP COVER OF THIS BOX SHOULD NEVER BE REMOVED. ELECTRICAL SHOCK HAZARD DUE TO HIGH INTERNAL VOLTAGE. THERE ARE NO USER SERVICEABLE PARTS INSIDE THIS IMAGING AND ILLUMINATION SYSTEM, EXCEPT FOR THE LAMP AND FUSE WHICH ARE ACCESSIBLE THROUGH THE BOTTOM AND BACK COVER PANELS.

3. PROVIDE VENTILATION TO PREVENT OVERHEATING.
   Provide adequate ventilation.
   Do not cover or drape imaging and illumination system.

4. Grounding reliability is achieved only when connected to "hospital-use" or "hospital-grade" receptacle. Inspect electrical plug and cord routinely. Do not use if damage is discovered.

5. WARNING: TOTAL SYSTEM RISK CURRENT - EXCLUDING THE PATIENT APPLIED PART (ENDOSCOPE) - SHOULD NOT EXCEED 100 MICROAMPS. AN ISOLATION TRANSFORMER IS REQUIRED IF TOTAL SYSTEM RISK CURRENT EXCEEDS 100 MICROAMPS WHEN ACCESSORIES ARE INTERCONNECTED. REFER TO OPERATING MANUAL FOR RECOMMENDED ISOLATION TRANSFORMERS AND PROPER MEASURING TECHNIQUES.

6. CAUTION: Always remove camera system from patient before connecting/disconnecting camera system to imaging and illumination system.

7. When possible, keep imaging and illumination system out of patient field. Always remove surgical imaging system from patient field while connecting/disconnecting camera.

8. Do not sterilize the imaging and illumination system. Refer to Operating Manual for cleaning instructions.

9. This TYPE-B imaging and illumination system is recommended for use with TYPE-F, floating endoscopes only.

SEE OPERATING MANUAL FOR ADDITIONAL WARNINGS, PRECAUTIONS AND INSTRUCTIONS FOR USE.

LAMP REPLACEMENT

CAUTION: Lamp may be hot. Lamp voltage is 60 volts≂ , 24 watts. Refer to Lamp Replacement section.

Contents

System Symbol Descriptions i

Introduction 4

Indications 4

Contraindications 4

Warnings and Precautions 5

System Description 7

Component Description 8

Power Box 8

Fiber Optic Bundle 11

CCD Camera Head and Cable 13

System Inspection 13

System Set-Up Procedure 13

Lamp Replacement 14

Fuse Replacement 14

Cleaning and Sterilization 15

Compatible Cleaning Methods 15

Instructions for Cleaning 16

Leakage Current Test Set Up 18

Troubleshooting 19

Specifications 22

Equipment Ordering 24

Warranty and Service 25

Introduction

The Welch Allyn LCI-200CE Illumination and Imaging System is fundamentally different from any other illumination or video system. In this product, Welch Allyn has combined a compact light source with a very small remote video camera which can be attached to any number of rigid or flexible scopes. By engineering both the video and the illumination end of the product Welch Allyn is able to produce a very small, highly efficient product. Furthermore, by combining the lighting and imaging in a single package, Welch Allyn has dramatically decreased the burden of system setup and has eliminated the need for the system white balance. The result is a compact, affordable lighting and video system for rigid and flexible endoscopic procedures.

Indications

Use of the Welch Allyn LCI-200CE Illumination and Imaging System is indicated whenever video imaging is preferred over standard optical eyepiece imaging. The product is designed to provide video imaging for a wide range of rigid endoscopes as well as flexible endoscopes. The LCI-200CE itself is not a scope; it merely provides video imaging for any existing scope. *For indications of use with each of these rigid and flexible scopes, the user must consult the operating manual for the specific rigid or flexible scope. The LCI-200CE must only be used with endoscopes that are approved for their indicated use.* This product must only be used by qualified medical personnel.

Contraindications

The use of the Welch Allyn LCI-200CE is contraindicated when a video image is not the preferred method of endoscopic visualization. For specific contraindications for various rigid and flexible scopes, the user must consult the operating manual for the particular scope being used.

Warnings and Precautions

CAUTION: IF THIS IMAGING AND ILLUMINATION SYSTEM IS USED DURING INVASIVE SURGERY, THE FAILURE OF A COMPONENT WITHIN THE SYSTEM, FOR EXAMPLE, LOSS OF VISUALIZATION, MAY INDIRECTLY CAUSE RISK TO THE PATIENT, THEREFORE, IT IS RECOMMENDED TO HAVE ALTERNATIVE MEANS AVAILABLE.

To ensure patient and operator safety, read and understand this manual before using the LCI-200CE.

POSSIBLE EXPLOSION HAZARD. Do not use in the presence of flammable anesthetics.

The top cover of the Power Box should never be removed. ELECTRICAL SHOCK HAZARD DUE TO HIGH INTERNAL VOLTAGE. THERE ARE NO USER SERVICEABLE PARTS INSIDE THE IMAGING AND ILLUMINATION SYSTEM EXCEPT FOR THE LAMP AND FUSE WHICH ARE ACCESSIBLE THROUGH THE BOTTOM AND BACK COVER PANELS. Refer all service to Welch Allyn.

Provide ventilation to prevent overheating. Do not cover or drape the Power Box. To ensure adequate airflow be sure to provide a 3 inch distance between the Power Box chassis and any solid objects.

Grounding reliability is achieved only when connected to hospital-use or hospital-grade receptacle. Inspect electrical plug and cord routinely. Do not use if damage is discovered.

WARNING: TOTAL SYSTEM RISK CURRENT - EXCLUDING THE PATIENT APPLIED PART (ENDOSCOPE) - SHOULD NOT EXCEED 100 MICROAMPERES. AN ISOLATION TRANSFORMER IS REQUIRED IF TOTAL SYSTEM RISK CURRENT EXCEEDS 100 MICROAMPERES WHEN ACCESSORIES ARE CONNECTED. Refer to Leakage Current Test Setup section for recommended isolation transformers and proper measuring techniques.

CAUTION: Always remove camera system from patient before connecting/disconnecting Camera Head to Imaging and Illumination System.

When possible, keep the Imaging and Illumination System out of patient field. Always remove the Power Box from patient field while connecting/disconnecting the Camera Head.

Do not sterilize the Power Box. Refer to Cleaning and Sterilization section for cleaning instructions.

This TYPE B Imaging and Illumination System is recommended for use with TYPE F floating endoscopes only. This is necessary to meet the requirements of IEC601-2-18 for a TYPE BF system.

Care should be exercised during procedures, such that fluids do not migrate across insulations between the TYPE B camera head and TYPE F endoscopes.

External equipment, which will be connected to signal input and signal output parts or other connectors, shall comply with relevant IEC standard (IEC 601 series for medical electrical equipment). In addition, all such combinations - *systems*- shall comply with the standard IEC 601-1-1 (Safety requirements for medical electrical systems).

Any person who connects external equipment to signal input and signal output parts or other connectors has formed a system and is therefore responsible for the system to comply with the requirements of IEC 601-1-1.

WARNING: Replace fuses as marked. See Fuse Replacement Section.

WARNING: The high intensity light at the front of the Power Box, at the tip of the Fiber Optic Bundle, and at the tip of the endoscope may give rise to high temperatures. To minimize the risk of injury, avoid prolonged contact with tissue.

Be sure that the Fiber Optic Bundle and Camera Head are plugged into the Power Box before turning the power ON.

Do not switch the LCI-200CE system ON and OFF in rapid succession. Doing so will dramatically shorten lamp life. The lamp needs to "cool down" for approximately 10 to 15 seconds between uses; if the user turns the LCI-200CE from **ON** to **OFF** and then immediately back **ON**, the lamp will not start, and the LAMP SERVICE light will illuminate.

Since the LCI-200CE uses a custom, proprietary Welch Allyn lamp **always have a spare lamp available for lamp replacement.**

Always attach the soaking cap to the camera connector before soaking.

Do not disconnect the Optical Coupler from the Camera Head before soaking, as this will make it possible for fogging to occur between the Camera Head and the Optical Coupler.

Do not remove the camera cable from the Power Box during operation. For best results, the camera cable should be plugged into the Power Box before the Power Box is turned **ON**. Although no damage will occur to the camera or CCD if the connection is made after the power is turned **ON**, the camera will temporarily shut down requiring the operator to restart the unit.

Do not store liquids above or on the LCI-200CE.

Do not attempt to service any part of this product except for lamp and fuse replacement.

WARNING: If used during invasive surgery, a spare system should be kept on standby.

System Description

The Welch Allyn LCI-200CE uses a proprietary Welch Allyn lamp to provide high quality illumination and a state-of-the-art SONY camera with HyperHAD to produce a brilliant video image.

The Welch Allyn lamp, covered by several patents, is a miniature arc lamp; it produces the same color temperature illumination as a high wattage Xenon arc lamp, but generates only a fraction of the heat. Whereas most Xenon light sources weigh over 25 pounds, the tiny Welch Allyn lamp allows the Illumination and Imaging systems to be combined in a box weighing less than 5 pounds. The Welch Allyn lamp produces a virtual "point source" of light, and is specifically designed to couple with a fiber optic bundle. Light output is modulated based on the needs of the camera.

The camera used in the LCI-200CE is an advanced SONY one-half inch CCD camera. This camera uses the proprietary HyperHAD microlens architecture, whereby hundreds of thousands of tiny light gathering lenses sit on top of the pixels on the CCD. These miniature lenses make the CCD extraordinarily sensitive to light. The SONY also operates in both Auto-Shutter and Fixed-Shutter speed modes, depending on the light levels required by the camera.

The three major components of the LCI-200CE are shown in the diagram below.

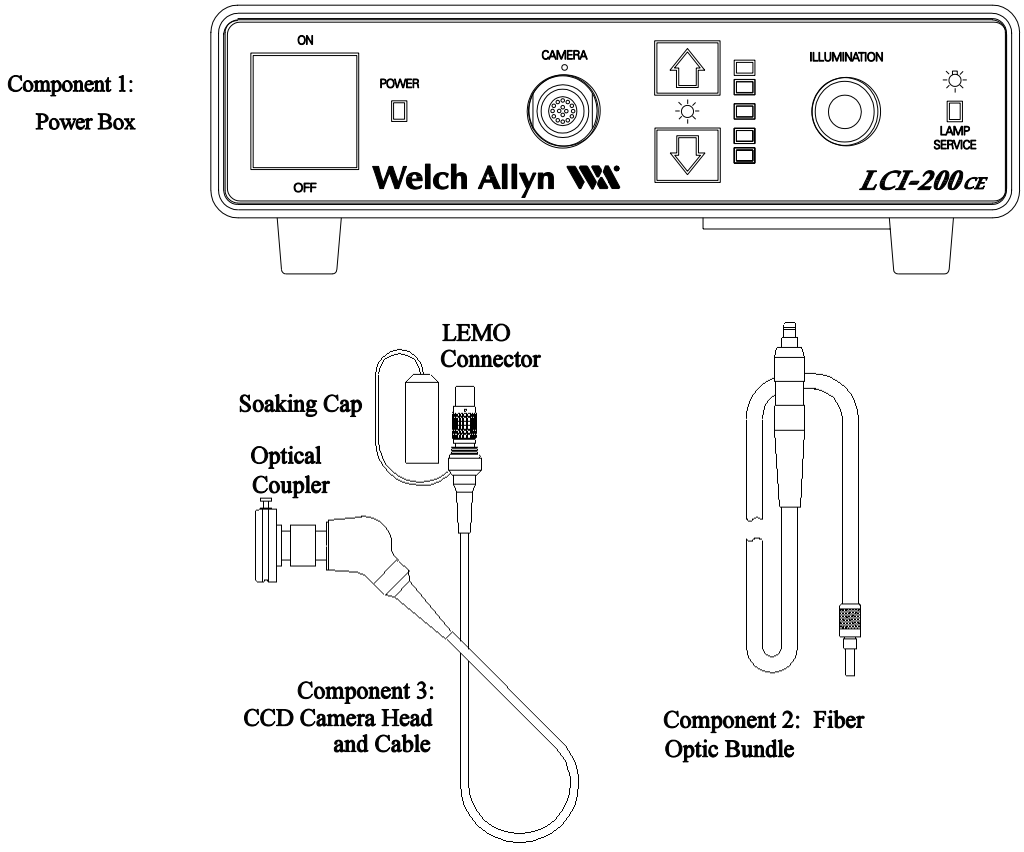


Figure 1: Welch Allyn LCI-200CE

Component Description

Component 1. The Power Box houses the lamp, camera processor and power supply. It is described in more detail below.

Component 2. A Fiber Optic Bundle, using an ACMI adapter on the Power Box end and a universal adapter on the scope instrument end, is provided. Using any number of adapters, the Fiber Optic Bundle is attached to any rigid or flexible scope.

Component 3. The remote camera is packaged into an ergonomically designed handpiece, specifically designed for endoscopic applications. A C-Mount Optical Coupler may be attached to the remote Camera Head, allowing the camera to adapt to the eyepiece of any rigid or flexible endoscope.

Power Box

The Welch Allyn LCI-200CE Illumination and Imaging System is fundamentally different from any other system available today, in that it combines the illumination and the video processing in a single, compact box. Instead of having a separate 300 watt Xenon light source and video processor these two components are combined in the LCI Power Box. The heart of the Power Box is a Welch Allyn lamp which provides superior illumination in a package that is a fraction of the size of typical endoscopic light sources. The light output provided by this lamp is automatically modulated by a mechanical shutter which alters light output based upon the needs of the camera. The LCI-200CE also houses the video processor for the camera; the camera used is a state-of-the-art SONY incorporating microlenses, high resolution, and a continuous, "non-stepping" Auto-Shutter mode for high performing light control that works in tandem with the mechanical light control shutter.

In addition to being smaller, the LCI-200CE Power Box is easier to set up and use than conventional endoscopic video systems. Since the light source and camera are integrated into a single package, there is no reason to white balance the LCI-200CE. With the LCI-200CE there are no cables that need to be connected between a separate light source and video processor. And the LCI-200CE operates exclusively in automatic light control mode, meaning that there are no adjustments that need to be made for light control. However, if the user wants to increase the overall picture brightness, this adjustment can be made on the front panel. Note that the LCI-200CE will still operate in automatic light control mode; only the overall picture brightness will change.

The LCI-200CE Power Box is driven by a universal switching power supply, which accepts 100-240 V~, 50-60Hz without having to be adjusted. This power supply automatically senses line voltage and makes the correct adjustments for any line input. The power supply is also Medical Grade and is approved for medical standards from UL, CSA, TUV, and IEC.

Diagrams of the front and rear panels of the Power Box on the opposite page. Detailed descriptions of the panels are also provided on the following page.

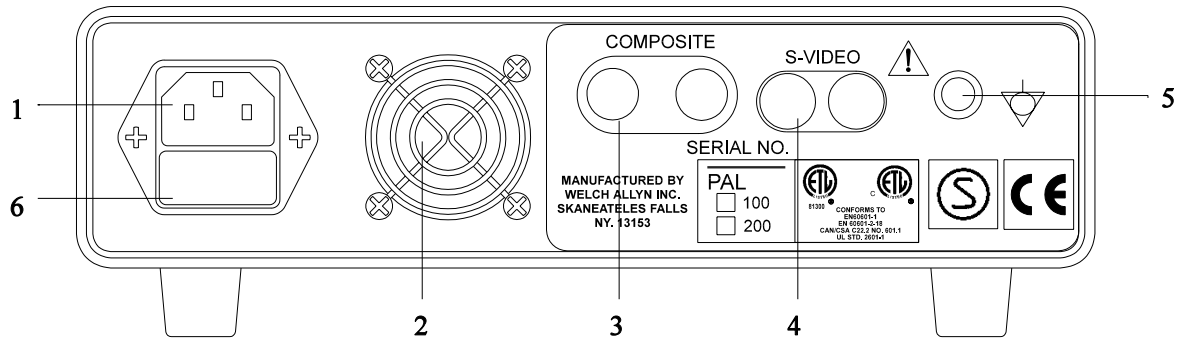


Figure 2: Rear Panel

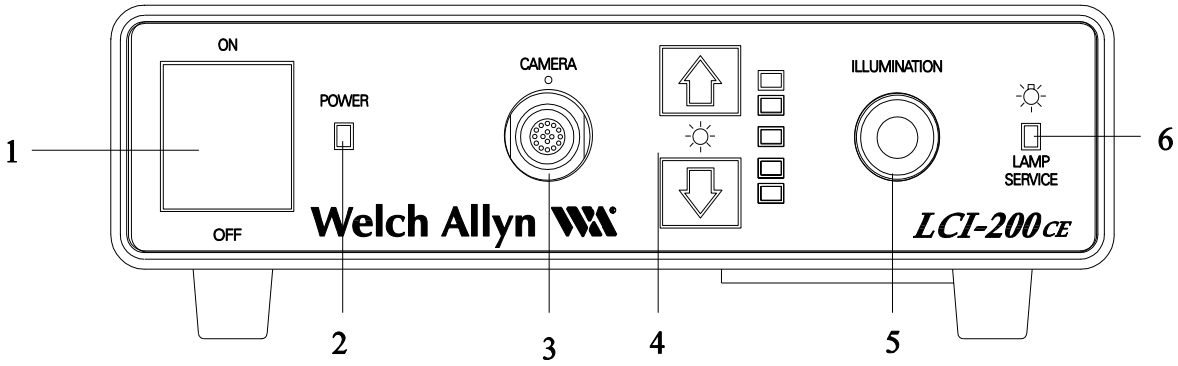


Figure 3: Front Panel

Rear Panel

1. AC Power Input
2. Fan Grill
3. 2 Composite Video Outputs, BNC Type Connector
4. 2 S-Video Outputs
5. Potential Equalization Stud
6. Fuse Drawer

Front Panel

1. Power Switch
2. Power Indicator
3. LEMO Connector for Camera Head
4. Picture Brightness Control
5. Light Port for Fiber Optic Bundle
6. Lamp Service Light

The single power switch located on the front panel provides power to the lamp, as well as to the camera system and the attached CCD. *The power should only be turned **on** when the Fiber Optic Bundle and Camera Head are plugged into the Power Box.* When the power is turned to the **ON** position, the power LED is illuminated, the lamps take 4-6 seconds to warm up, and the camera is immediately started.

In the middle of the front panel is the Camera Connector Port. The Camera Head should be plugged into this connector before the unit is turned **ON**. *The camera connector should be dry of any liquid cleansers when it is plugged into the Power Box connector. The camera connector should be plugged into the Power Box before turning the power **ON.***

The light port is found on the right side of the front panel. This light port accepts only an ACMI standard Fiber Optic Bundle connector. Welch Allyn provides this Fiber Optic Bundle for rigid scopes, and also provides adapters so that flexible scopes can be plugged directly into the Power Box. See the next section for further details on the Fiber Optic Bundle. *The Fiber Optic Bundle must be plugged into this port **before** the power is switched **ON.*** Next to the light port is a lamp service indicator which illuminates when the lamp is near the end of its life. The lamp in the Welch Allyn LCI-200CE typically lasts several hundred hours, based on a 45 minute **ON**/15 minute **OFF** duty cycle.

Between the light port and the camera port is a brightness control panel. The LCI-200CE allows the user to set the overall picture brightness of the Camera System by making adjustments on this control panel. Pressing the **UP** arrow makes the overall picture brighter, and pushing the **DOWN** arrow makes the overall picture darker. Note that, no matter what the setting is, the system always works in automatic light control mode. The user adjustments only change the overall brightness of the picture. The picture brightness control defaults to the center position when the LCI-200CE is turned on. The automatic light control functions by the use of a mechanical shutter which modulates the amount of light required for the camera. The shutter speed of the camera remains constant and only the amount of light is modulated. The automatic light control operates in this mechanical-automatic mode in all positions, with the exception of the highest picture brightness position. When the user sets the picture brightness to the maximum position, the shutter opens to allow the maximum amount of light, and the SONY camera operates in Auto-Shutter mode. In this way the user is able to choose both picture brightness and mechanical vs. electronic light control modes. In most cases the mechanical light control mode is preferred.

On the rear panel, a power cord connector is found on the far left side. Next to the power connector is a fan with a protective grill and then the video output connectors. Two S-Video connectors and two composite video connectors are available; any or all of the connectors can be used at one time. Finally, on the far right of the rear panel is a potential equalization stud which can be used as a safety ground; it can also be used to ground the system, particularly when there is a risk of video noise caused by electrosurgery units.

The LCI-200CE complies with the requirements of EN60601-1, EN60601-1-2, IEC 601-2-18, CAN/CSA 601.1 and UL 2601.

"The CE mark on this product indicates it has been tested to and conforms with the provisions noted within the 89/336/EEC Electromagnetic Compatibility Directive".

Fiber Optic Bundle

For rigid endoscopy, the Welch Allyn LCI-200CE Power Box requires a Fiber Optic Bundle to carry the light from the Power Box to the rigid endoscope. Welch Allyn provides a 5mm diameter Fiber Optic Bundle which is designed specifically for the Power Box. This Fiber Optic Bundle has an ACMI adapter on the Power Box end and a universal light post at the scope end. Scope Adapters are available for the universal light post to accommodate all rigid scopes. These adapters screw onto the universal light post. See diagram below:

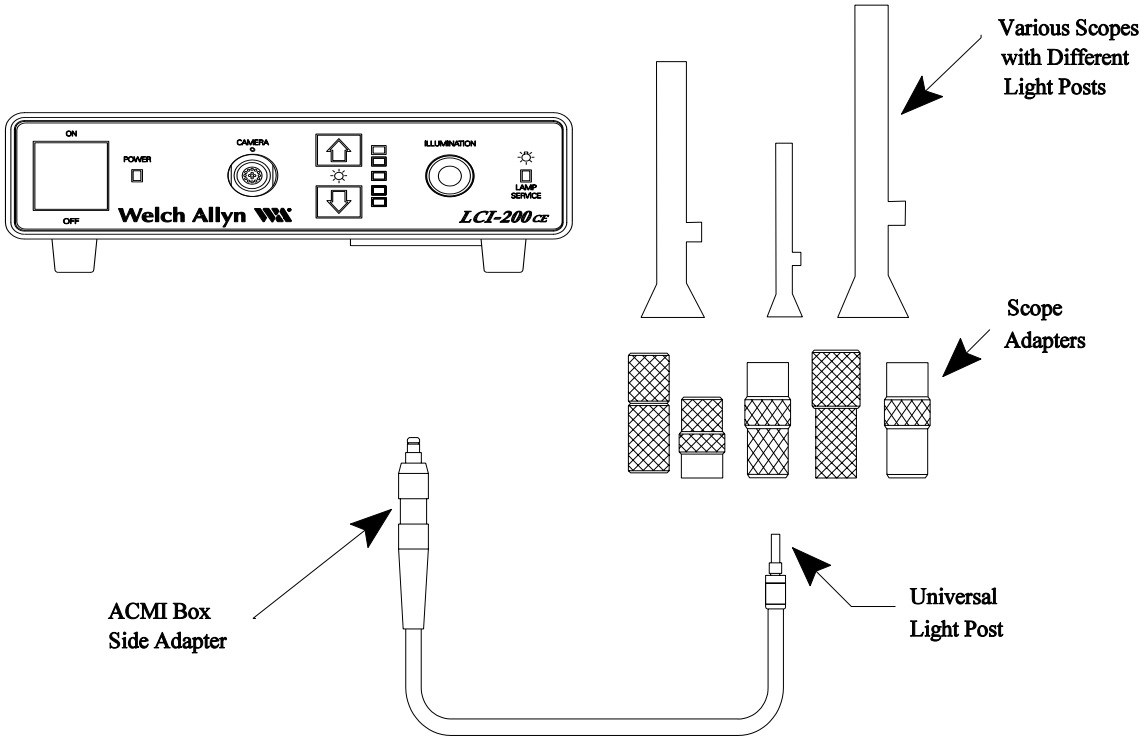


Figure 4: Fiber Optic Bundle used with Scope Adapters

When snapping the Fiber Optic Bundle into the Power Box, the user will notice a tight connection. Three ball detents hold the Fiber Optic bundle in precise alignment with the Welch Allyn lamp. This alignment is critical to the performance of the product. Because of this tight alignment, **only the Welch Allyn Fiber Optic Bundle should be used**; if other Fiber Optic Bundles are used, the quality of the illumination and the image will be compromised.

WARNING: Inserting the light post end of the fiber optic bundle into the power box may result in severe damage.

Unlike rigid borescopes, which require a separate Fiber Optic Bundle to carry light from the light source to the scope, most flexible scopes have a Fiber Optic Bundle which runs all the way from the light source to the tip of the scope. In order to accommodate these flexible scopes, Welch Allyn has developed a number of adapters which convert the fiber optic connector to an ACMI standard. The diagram below illustrates this with several flexible scopes.

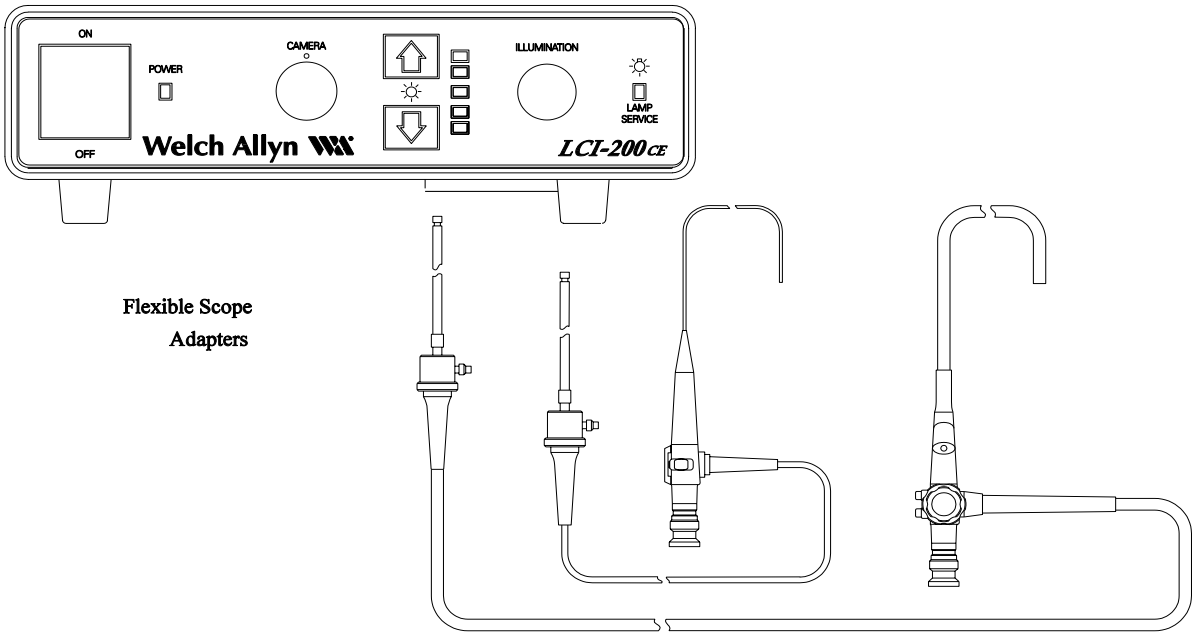


Figure 5: Flexible Scopes with Adapters

These adapters are available from Welch Allyn, and allow any flexible fiberscope to plug directly into the Welch Allyn LCI-200CE system.

CCD Camera Head and Cable

The CCD camera used in the Welch Allyn Illumination and Imaging System is a high performance, 1/2 inch SONY CCD, using Auto-Shutter, HyperHAD, and an automatic color tracking system. The CCD is operated in either fixed shutter speed or Auto-Shutter mode, depending on the picture brightness control setting. HyperHAD technology, developed by SONY, places a tiny light-gathering lens on top of each pixel, making the CCD over 2 1/2 times more sensitive to light than the conventional CCD. The CCD is packaged into a very small, ergonomically designed handpiece, and the cable is packaged in a sturdy but lightweight neoprene cord, under which is a strong, stainless steel braid.

The Camera Head has a standard C-Mount interface, which can accept any C-Mount Optical Coupler. Welch Allyn provides a fixed focal length, 35mm Optical Coupler with the LCI-200CE. The LCI-200CE does not require that the screen image occupy a certain percentage of the total screen.

At the other end of the CCD imager head a connector is permanently connected to the cable. This cable plugs into the front panel of the Power Module. A connector cap is also provided which must be attached to the connector before cleaning the Camera Head and Cable. *The connector should never be wet when plugged into the Power Box. The connector should be plugged in before the power button is switched to the **ON** position.*

System Inspection

Prior to use inspect the Camera Cable, head, and connectors for signs of wear. Ensure that the lens system is securely attached to the Camera Head. Likewise, the Fiber Optic Bundle should be inspected for abnormalities. Be sure that the proper adapters are used on the Fiber Optic Bundle in order to make a secure connection between the Fiber Optic Bundle and the scope. Finally, before plugging the Camera Head into the Power Box, check that it is dry and free of rinsing and/or soaking solution.

System Setup Procedure

1. Plug the Power Box into a hospital grade receptacle. Make either the S-Video, the Composite Video, or both of the connections between the Power Box and a video monitor.

2. For rigid endoscopy, plug the Welch Allyn Fiber Optic Bundle into the Power Box and connect the proper adapter to the scope end of the Fiber Optic Bundle. Attach the Fiber Optic Bundle to the proper scope. For flexible endoscopy attach the proper flexible Scope Adapter to the Power Box end of the flexible scope. Plug the scope and adapter into the Power Box.

3. Plug the Camera Cable connector into the front panel of the Power Box. Attach the scope to the Optical Coupler.

4. Turn the power to the **ON** position.

After turning the power **ON** the lamp will take 4-6 seconds to complete its warm-up routine. At the end of that time a high intensity white light will appear out of the scope. Since Welch Allyn integrates the lamp, fiber optics, and video system into a single product family, *there is **no** need to white balance the system.*

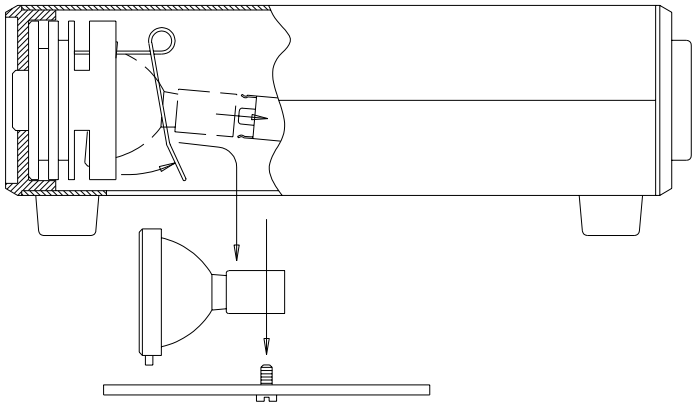
The lamp needs to "cool down" for approximately 10-15 seconds between uses. Attempting to restart a lamp in less than this amount of time will shorten the life of the lamp.

Lamp Replacement

The Welch Allyn LCI-200CE uses a proprietary Welch Allyn lamp which typically lasts several hundred hours when used for one hour procedures. **Always have a spare Welch Allyn lamp in stock for immediate replacement when needed. USE CAUTION BECAUSE LAMP MAY BE HOT.** To replace the lamp, follow the steps below and consult the diagram at the bottom of the page.

1. Unplug the power cord from the Power Box.
2. Remove the lamp door from the bottom of the Power Box using a flathead screwdriver.
3. Disconnect the lamp connector assembly and remove the lamp from the holding spring assembly.
4. Replace with VA294 Welch Allyn Replacement Lamp only. Pay attention not to touch the lamp itself, or the interior reflective surface of the lamp, as skin oils on the lamp will cause premature lamp failure. Handle the lamp by holding the outside of the reflector or the connector only.
5. Re-connect the lamp to the lamp connector and place the lamp into the spring mechanism. Be sure that the pin fully engages the slot on the lamp bracket.
6. Replace lamp door and attach securely.

The unit will not power up unless the lamp door is firmly and securely replaced.



Fuse Replacement

1. Turn the Power Switch **OFF** and remove the Power Cord from the Power Box.

2. Remove the fuses from the Fuse Holder at the A.C. Power Input Receptacle (see Figure 2).

3. If a fuse is blown, replace with a new fuse of the same type. Be sure to check both fuses. Replacement fuse is a 2.0 Amp, 250 Volt, 5 x 20mm, Type F2AL, which is Welch Allyn's part number VA303.

4. If the Power Box blows the new fuse, contact Welch Allyn Product Service Group.

Cleaning and Sterilization

Carefully review the instructions for cleaning and sterilization found in this manual. The first section highlights compatibility of the LCI-200CE with various cleaning methods, and the next section highlights instructions for cleaning of each of the components of the LCI-200CE.

Compatible Cleaning Methods

BE SURE TO FOLLOW YOUR INSTITUTION'S SPECIFIC CLEANING AND STERILIZATION PROCEDURES IN CONSULTATION WITH THIS OPERATING MANUAL. *Sterilization is always recommended for devices coming in contact with the patient; always sterilize rigid and flexible scopes before use.* Note that the LCI-200CE Illumination and Imaging System does not come in patient contact (it attaches to the proximal end of an endoscope).

1. *Power Box (illustrated in Figure 1)*
   The Power Box should not be sterilized. To clean, turn power **OFF**, and disconnect the power cord from the Power Box. The surfaces may be cleaned by wiping with a damp cloth using a mild detergent.

2. *Fiber Optic Bundle and Scope Adapters (illustrated in Figures 1 and 4)*
   The Fiber Optic Bundle and Scope Adapters are compatible with the following cleaning methods:
   - ETO (ethylene oxide) sterilization (see instructions on the following page)
   - 2% glutaraldehyde soak (10 hours for sterilization, 30 minutes for disinfection)
   - Autoclaving
   - Steris

3. *Camera Head, Camera Cable, and Optional Optical Coupler (illustrated in Figure 1)*
   The Camera Head, Camera Cable, and Optical Coupler are compatible with the following cleaning methods:
   - ETO (ethylene oxide) sterilization (see instructions on the following page)
   - 2% glutaraldehyde soak (10 hours for sterilization, 30 minutes for disinfection)
   - Steris

WARNING: The Camera Head, Camera Cable, and Optical Coupler should never be autoclaved.

The Camera Head Assembly and Fiber Optic Assembly may also be draped.

Instructions for Cleaning

System Disassembly

1. Turn Power Box **OFF**.

2. Disconnect Fiber Optic Bundle from the Power Box. Pull the ACMI adapter straight out.

3. Disconnect Scope Adapter from the Fiber Optic Bundle.

4. Disconnect the Camera Head Cable from the Power Box. Release the LEMO connector by pulling the shell straight back approximately 0.1 inch. This will release the locking mechanism. Continue pulling the connector straight back so it disconnects from the Power Box.

5. Immediately screw the Soaking Cap onto the LEMO Connector and secure tightly.

6. The Optical Coupler may be disconnected from the Camera Head for cleaning; however, it is recommended that the coupler be left connected to the Camera Head during cleaning procedures. This will minimize the chance of condensation forming between the coupler and the Camera Head when the two pieces are reattached, and will thus reduce the chances of fogging during use.

Cleaning/Sterilization

1. Rinse the Camera Head and Cable, Optical Coupler, Fiber Optic Bundle, and Scope Adapters in lukewarm tap water. Use a mild enzymatic detergent to remove any resistant debris.

2. Follow your institutions specific cleaning procedures at all times. **Always sterilize the endoscope that is used with the LCI-200CE**. Specific sterilization instructions for the LCI-200CE appear below. To ensure compatibility and prevent damage to the LCI-200CE, consult the previous section on *Compatible Cleaning Methods*.

   ETO Sterilization (for Camera Head Assembly and Fiber Optic Bundle)
   To sterilize the Camera Head, Cable, and Fiber Optic Bundle, the components may be short cycle ETO cycled in a temperature of 130±5 degrees F., 60±20% RH for two hours, followed by a 12 hour aeration at 120±5 degrees F.

   Long Soak Sterilization (for Camera Head Assembly and Fiber Optic Bundle)
   To sterilize the Camera Head, Cable, and Fiber Optic Bundle, the components may be soaked in a 2% glutaraldehyde solution for 10 hours. After this period, the components should be rinsed in sterile water to remove any soaking solution.

   Short Soak Disinfection (for Camera Head Assembly and Fiber Optic Bundle)
   To disinfect the Camera Head, Cable, and Fiber Optic Bundle, the component should be soaked in a 2% glutaraldehyde solution for 30 minutes. After this period, the components should be rinsed in sterile water to remove any soaking solution. NOTE: All endoscopes used with the LCI system should be sterilized, not just disinfected, per the instructions on the endoscopes.

3. The Camera Head, Camera Cable, and Fiber Optic Bundle should be dried with a lint-free, sterile cloth. The glass window on the Camera Head and Optical Coupler should not be allowed to air dry as this may lead to fogging.

Before using a Camera Head that has been soaked, the user must ensure that there is no moisture on or in the LEMO connector. Any moisture that is on the pins of the connector should be dried off gently with a lint-free, sterile cloth. If moisture is on the connector when it is connected to the Power Box, the system may not function properly.

System Reassembly
Be sure to follow your institution's sterility procedures while reassembling the LCI-200CE.

1. Ensure Power Box is turned **OFF.**

2. Connect Fiber Optic Bundle to the Power Box. Connect the appropriate scope adapter to the universal light post at the end of the Fiber Optic Bundle.

3. If applicable, connect and secure the Optical Coupler and endoscope to the Camera Head. Connect Fiber Optic Bundle to the endoscope.

4. Unscrew the soaking cap on the LEMO connector. Align the orange dot on the top of the LEMO connector with the orange dot on the Power Box. Gently push the LEMO connector into the Power Box connector. Ensure that the LEMO shell latches.

   WARNING: Because surfaces of this LEMO connector may not be sterile, avoid handling sterile assemblies after connecting the LEMO connector to the Power Box. Follow your institution's guidelines for further procedures.

5. Turn Power Box **ON** and verify that the LCI-200CE functions properly. If picture does not appear, turn **OFF** power and verify that the LEMO connector is fully seated. If problems persist, see section on Troubleshooting.

Leakage Current Test Setup

When the LCI-200CE camera system is used in conjunction with other video accessories (such as printers and VCRs), it may be necessary to measure the leakage current of the entire setup. A typical setup is shown in Figure 6 below. Using a standard leakage tester, this setup will allow the overall system leakage current to be measured. An isolation transformer must be used if the leakage current exceeds 100 microamperes, in order to conform with EN60601-1 standards. The maximum allowable leakage current of the patient applied part (Type F endoscope) is 100 microamperes.

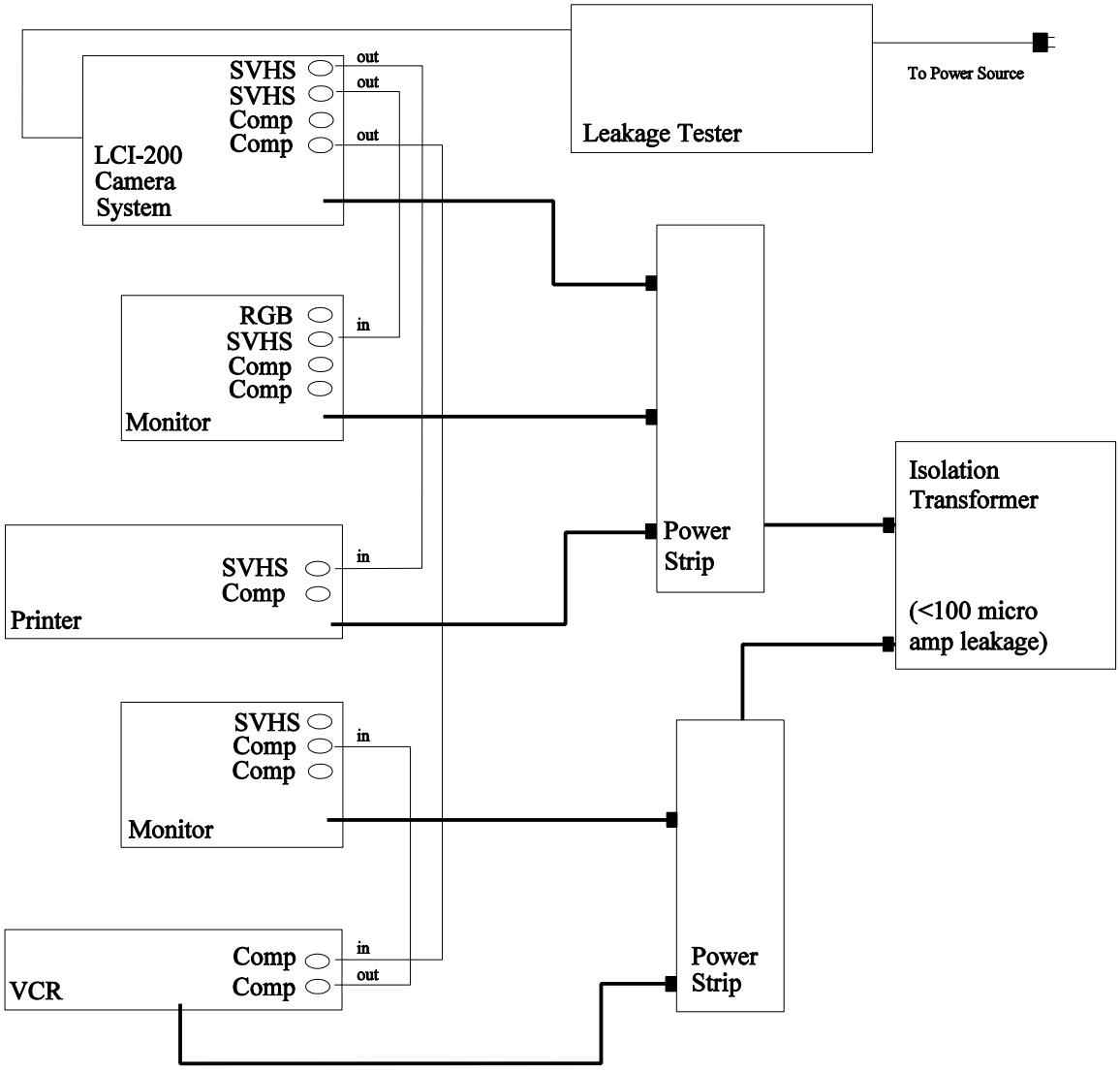


Figure 6: Typical Leakage Current Test Set Up

Troubleshooting

Always be sure that the equipment is properly configured and is being used properly before returning any equipment. Also, try to isolate the problem equipment (Power Box, Camera Head, scope, monitor, VCR) before returning equipment. Be sure to identify the problem symptom below and try the suggested corrective action. If, after exhausting these options, the problem persists, contact Welch Allyn (see **Warranty and Service** section).

Symptom: No Picture, Power LED not illuminated, Lamp is not illuminated

- Is Power Box plugged into wall outlet?
- Is Power switch turned **ON**?
- Is lamp door on bottom of the Power Box secured in place?
- Check fuses.
- Substitute a new power cord.

Symptom: No Picture, Power LED is illuminated, Lamp is illuminated

- Was the Camera Head connected to the Power Box before the power was turned **ON?** Connecting the Camera Head to the Power Box while the power is **ON** causes the camera to shut down. To correct, turn the power **OFF**, connect the Camera Head, wait ten seconds, and restart.
- Is the monitor plugged into the wall outlet and turned **ON**?
- Are BNC and S-Video cables connected to the monitor and Power Box? Are the cables defective? Try substituting new video cables. Trace video cables through the system, ensuring that they are properly connected through the peripherals and into the monitor.
- Is the monitor set up properly? Is the video connection made to the correct connector on the monitor? Ensure that the proper video channel is selected on the monitor, and that the brightness is properly set.
- Are all accessories (VCR, video printer, etc.) turned on and switched to "Line"? Is the VCR record button **ON**? Try disconnecting the accessories.
- Is the rod lens scope properly secured to the Optical Coupler?
- Check to ensure that the serial number of the Camera Head is the same as the serial number of Power Box; if they are not the same number, return unit to your dealer.

Symptom: Lamp is OFF, Power LED ON, Lamp Service LED is ON

- Was the lamp able to "cool down" before the power was turned **ON**? If not, turn the Power Box **OFF**, wait 10 seconds, and turn it back **ON.**
- If the lamp still does not start even after being allowed to cool down, replace the lamp assembly (see Lamp Replacement Section).
- If problem persists with new lamp, return Power Box to Welch Allyn for repair.

Symptom: Picture good, Power LED ON, Lamp is illuminated, Lamp Service LED is ON

- *If the service LED turns on approximately 5-10 seconds after initial lamp ignition*, then replace the lamp and verify proper function. If problem persists, return the unit to Welch Allyn for repair.
- *If the service LED turns on approximately 30 seconds to 30 minutes after initial lamp ignition,* then the lamp is near the end of its life. Replace the lamp as soon as possible.

Symptom: Intermittent Video

- Check all video connections: Camera Head to Power Box, Power Box to monitors, etc. Substitute different video cables. Take the printer or VCR out of the video signal loop.
- Wiggle the connector and cable between the Camera Head and cable, and between the cable and the Power Box. If this exaggerates the intermittent video signal, return the unit to Welch Allyn.
- Check to ensure that the serial number of the Camera Head is the same as the serial number of Power Box; if they are not the same number, return unit to your dealer.

Symptom: Bad Color in Video Picture

- Have the lamps completely warmed up (10 seconds)?
- Does the lamp need to be replaced?
- Are the color settings on the video monitor properly set? Has the video monitor been calibrated recently (ie: in the past six months)? Make any necessary adjustments to the monitor or try a new monitor.
- If a printer or VCR is being used, try taking it out of the video loop.
- Check the video cables being used. Try substituting new video cables.
- Check the Fiber Optic Bundle being used; is it the Welch Allyn Fiber Optic Bundle sold with the LCI-200CE or is a different bundle being used? The integrity of color can only be guaranteed when the Welch Allyn VA295 Fiber Optic Bundle is being used. If the Fiber Optic Bundle appears to be damaged, replace it with a new VA295 bundle.
- Are the air vents on the Power Box obstructed? If so, move the Power Box to ensure adequate ventilation.
- Check to ensure that the serial number of the Camera Head is the same as the serial number of the Power Box; if they are not the same number, return unit to your dealer.

Symptom: Video Interference (especially when used with electrosurgery)

NOTE: A small amount of video interference is normal. If the interference is objectionable, then try the following:

- Be sure a hospital grade power cord is being used.
- Be sure that the Power Box is properly grounded.
- Try plugging the electrosurgery unit into a different power outlet *on a different circuit*.
- Minimize the overlap between the video cable and the electrosurgery cable.
- Using a type F endoscope will help minimize electrosurgery interference.
- Change the picture brightness control on the front panel; the default (center) position should cause the least amount of video interference.
- Ensure that all video equipment (monitor, slave monitor, VCR, etc.) is plugged into one wall outlet.

Symptom: Blurry or "Soft" Image; Image not Sharp

- Adjust settings on monitor or printer, starting with the controls in the reset position.
- Check the focus on the Optical Coupler.
- Remove the endoscope from the Optical Coupler and look through the endoscope. If the image appears blurred, the endoscope needs repair. Return the scope to the proper manufacturer.
- Check to make sure that there is no moisture between the endoscope and the coupler. If moisture is present, dry it off with a soft cloth.
- There should never be moisture between the Camera Head and the coupler, as long as the two components are kept together when they are soaking. *To prevent fogging, the coupler should never be removed from the Camera Head prior to or immediately after soaking.*
- Check for fingerprints on all lens surfaces.
- Does camera head and power box serial number match?

Symptom: Spots on Image

- Check the optical surface between the scope and Optical Coupler.

Symptom: Grainy Image

- Is enough light being delivered to the tip of the scope? Does the lamp need to be replaced?
- Is the Fiber Optic Bundle damaged so that not enough light is being delivered? Try new lamps and a new Fiber Optic Bundle.
- Adjust monitor and/or printer settings, starting with controls in the reset position.
- Ensure the camera cable is fully plugged into the Power Box.
- Remove all accessories from the setup and verify that the image is acceptable using only the LCI-200CE and the monitor.
- Increase the picture brightness setting to a higher position.

Symptom: Dark Picture

- Adjust the monitor and/or printer, starting with the controls in the reset position.
- Increase the picture brightness setting to a higher position.
- Check to verify that the lamp is functioning.
- Check to verify that the Fiber Optic Bundle is not damaged, and that it is still transmitting an adequate amount of light.
- Remove all accessories from the setup and verify that the image is acceptable using only the LCI-200CE and the monitor.
- Does camera head and power box serial number match?

Specifications

Power Supply

100-240V~, 50-60 Hz, automatically adjusted
Input Current: 1.0 - 0.5 Amp

Dimensions

9.25 inches wide x 8.125 inches deep x 2.375 inches high
Less than 5 pounds

Outputs

2 Y/C S-Video Type
2 Composite BNC type, 1.0V p-p 75 ohms

Illumination System

Proprietary Welch Allyn Arc Lamp
Color Temperature 5500 degrees K
Lamp: 60 Volts ~, 24 watts
Lamp Life averages several hundred hours when used for a 45 minute ON/15 minute OFF duty cycle. Average lamp life decreases substantially when shorter duty times are used.

Shutter System

Mechanical: Motor driven shutter
Electrical: Infinitely variable, no-step Auto-Shutter

Image Device

1/2" SONY Interline Transfer CCD with HyperHAD
756 x 581 Total Pixels (PAL)
Cable Length 10 feet

Scanning System

2:1 Interlaced, 625 lines, 25 frames/sec (PAL)

Horizontal Resolution

Greater than 470 lines

Fiber Optic Bundle Interface

Power Box Side: ACMI
Scope Side: Universal
Bundle Length: 7.5 feet

Approvals

UL-2601, EN60601-1, IEC601-1, IEC601-2-18, and CAN/CSA 601.1
89/336/EEC Electromagnetic Compatibility Directive

Equipment Classification

Power Box - Class I, Type B
Camera Head - IPX7, Type B
When used with Type F endoscope, complete system is classified Type BF

Environmental Conditions

Storage

Humidity:	10 to 100% (condensating)
Temperature:	-20 deg. C to +60 deg. C

Use

Humidity:	10 to 95% (non-condensating)
Temperature:	+5 deg. C to +40 deg. C

Fuses

250V, 2.0 amps, 5 x 20mm, Type F2AL

Patents

5,144,201; 5,083,059; 5,138,228; 5,117,154; others pending

Equipment Order Numbers

LCI-200CEP	Welch Allyn LCI-200CE Camera System, PAL
VA294	Replacement Lamp, LCI
VA295	7.5 foot Fiber Optic Bundle, LCI
VA296	Storz Scope Adapter, LCI
VA297	Wolf Scope Adapter, LCI
VA298	ACMI Scope Adapter, LCI
VA299	Replacement 35mm Optical Coupler
VA300	Replacement 45mm Optical Coupler
VA350	Replacement 28mm Optical Coupler
VA301	Carrying Case
VA370	LCI-200CE Operating Manual
VA303	Replacement Fuse, 2.0A, 250V, 5x20mm
VA285	S-Video Cable, 12 feet
VA177	Composite Cable, 10 feet
VA284	US Power Cord
VA284-2	International Power Cord
VA316	LCI-100/200 Service Manual
VA360	Isolation Transformer 120V 4.6 Amps
VA361	Isolation Transformer 120V 8.4 Amps

Warranty and Service

Welch Allyn warrants the LCI-200CE, when new, to be free of defects in material and workmanship and to perform in accordance with manufacturer's specifications when subject to normal use and service for a period of one year from the date of purchase from Welch Allyn or an authorized agent. Welch Allyn will either repair or replace any components found to be defective or at variance from manufacturer's specifications within this time at no cost to the customer. It shall be the purchaser's responsibility to return the instrument directly to the authorized distributor, agent, or service representative.

This warranty does not cover the HI-Lux Lamp or breakage or failure due to tampering, misuse, neglect, accidents, improper installation, modification, shipping, or to improper maintenance, service, and cleaning procedures. This warranty is also void if the instrument is not used in accordance with manufacturer's recommendations or if required or serviced by other than Welch allyn or an authorized agent. Purchase date determines warranty requirements. No other express or implied warranty is given.

Service Manuals are available from Welch Allyn. For Service assistance or questions regarding this warranty, please contact Welch Allyn at:

US, Europe, and Asia
Welch Allyn, Imaging Products Division
4619 Jordan Road
Skaneateles Falls, NY 13153
Telephone: (315) 685-4108
Fax: (315) 685-2920

Latin America
MD International
7324 S.W. 48th Street
Miami, FL 33155
Telephone: (305) 669-9003
Fax: (305) 669-8951

Europe
Welch Allyn GmbH
Zollerstrasse 2-4
D-72417 Jungingen
Federal Republic of Germany
Telephone: 011-49-74779-27273
Fax: 011-49-74779-27293

Asia
Welch Allyn Hong Kong
10/F Tung Sun Commercial Ctr.
194-200 Lockhart Rd
Wanchai
Hong Kong
Telephone: 011-852-2511-3050
Fax: 011-852-2511-3557

Australia
Welch Allyn Australia Pty Limited
ACN 062 931 462
Ground Floor
18-20 Orion Road
Lane Cove
NSW 2066
Australia
Telephone: 011-612-418-3155
Fax: 011-612-418-3650